Econometrics 2 for Economics and Finance – Seminar 3b

Problem 3: Forecasting Future Sales. You are working for a company in their sales forecast team Your boss asked your team colleague to work on the model that will serve to forecast future sales based on historical sales data. For simplicity, the sales variable at time t is denoted by Y_t. To this end, your colleague relied on the ARIMA modelling.

Unfortunately, your colleague has gone on vacation, leaving behind a file with several graphs and econometric results (tests, estimations). They entrusted you with the folder, and you must present the conclusions to your boss by tomorrow.

Task: Select the ARIMA model that will serve to forecast future sales using Box-Jenkins methodology. To do so, you will need to answer the following questions:

1. What are the four steps in the Box-Jenkins methodology?
2. Which Figure is useful for which step?
3. What is the conclusion at each step?

The file: pages 2 – 11

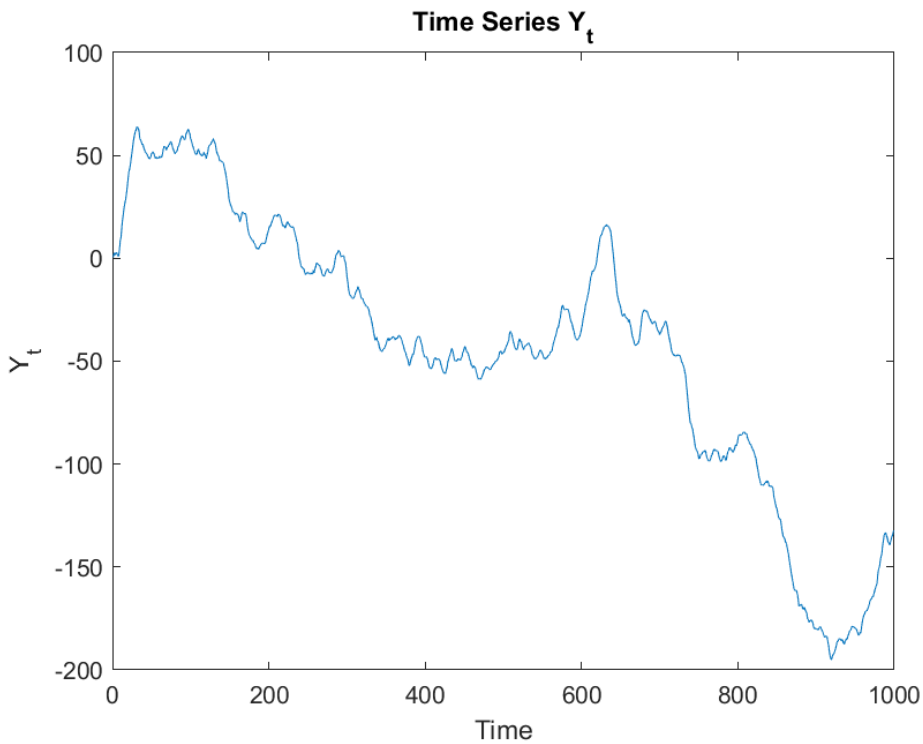

Figure 1: Plot of Y_t

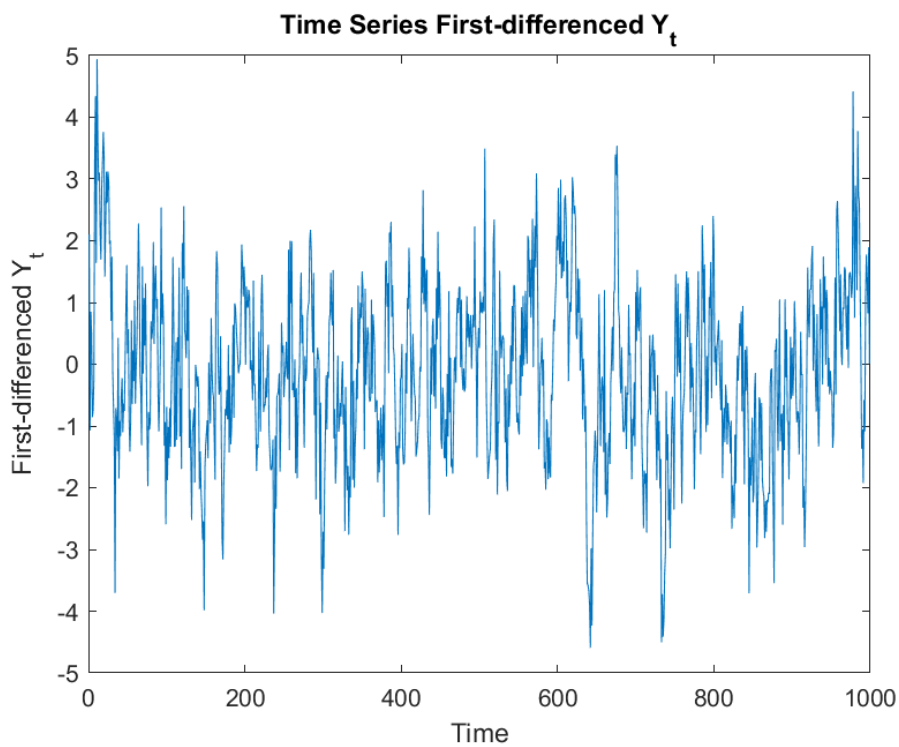

Figure 2: Plot of First-differenced Y_t

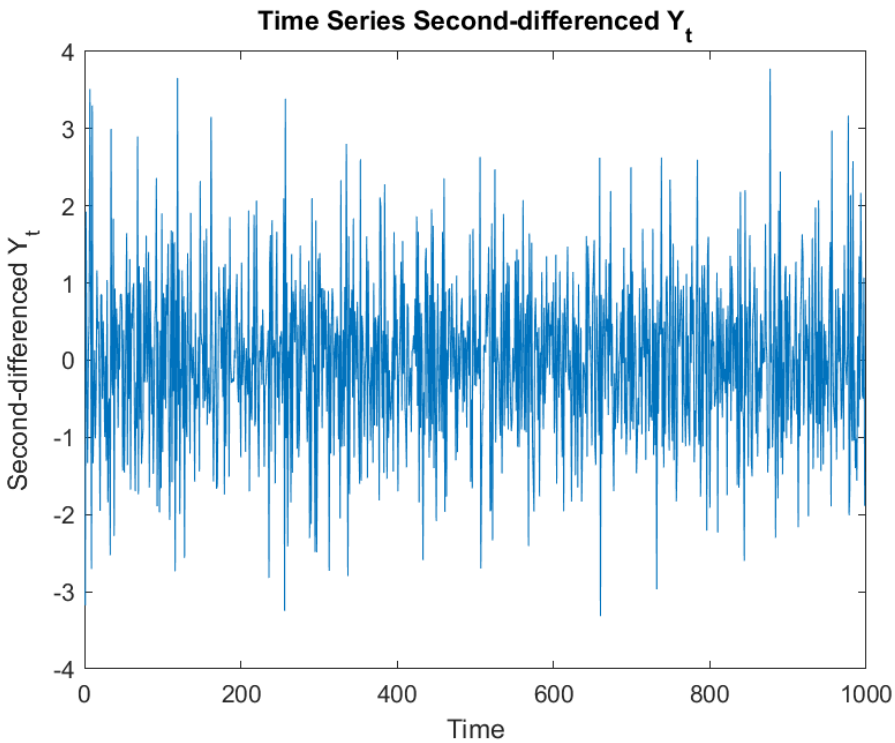

Figure 3: Plot of Second-differenced Y_t

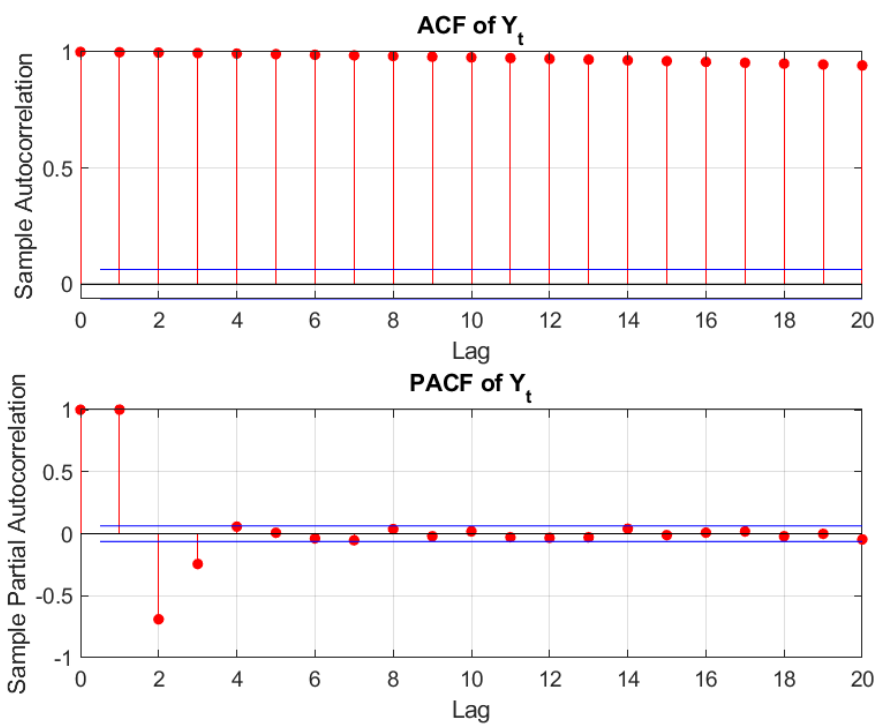

Figure 4: ACF/PACF of Y_t

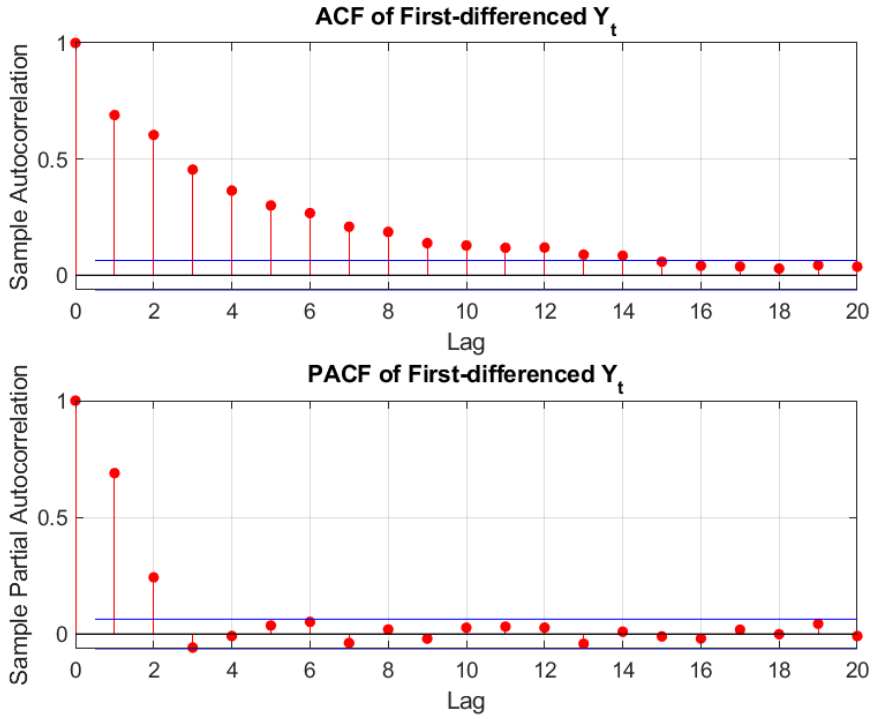

Figure 5: ACF/PACF of First-differenced Y_t

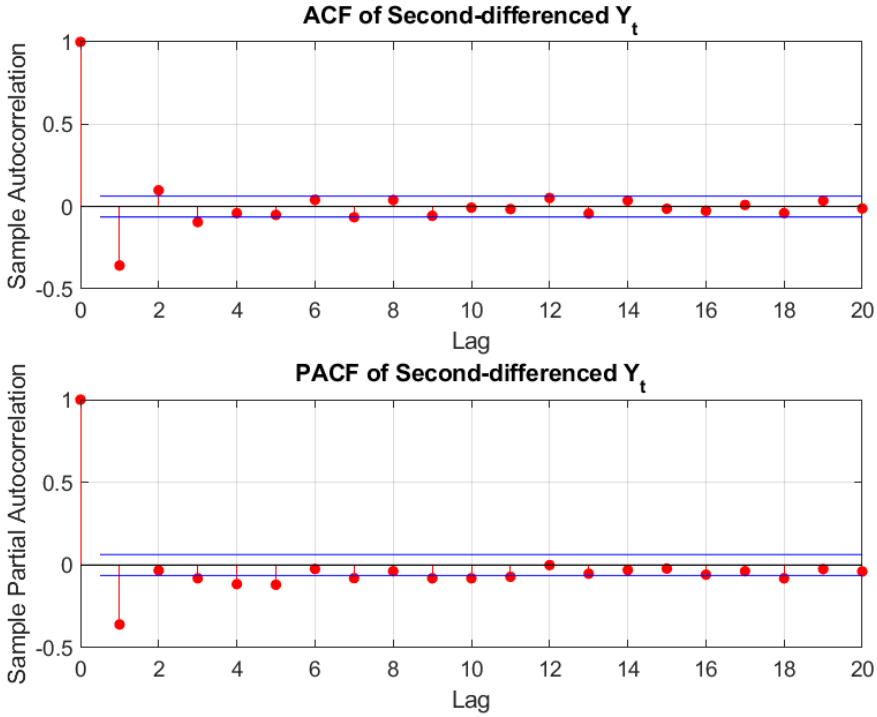

Figure 6: ACF/PACF of Second-differenced Y_t

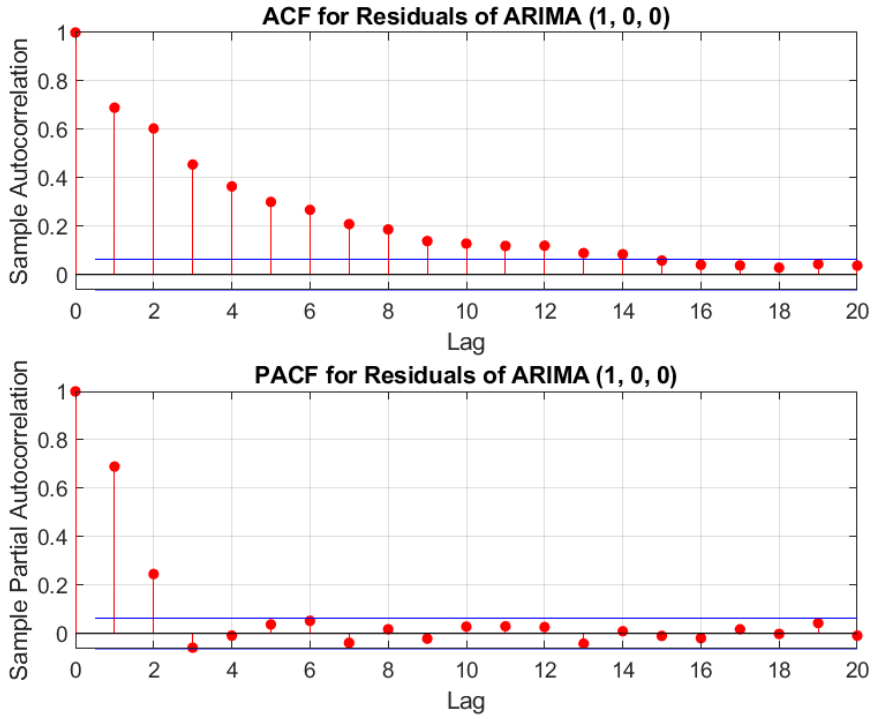

Figure 7: ACF/PACF of Residuals of ARIMA(1,0,0)

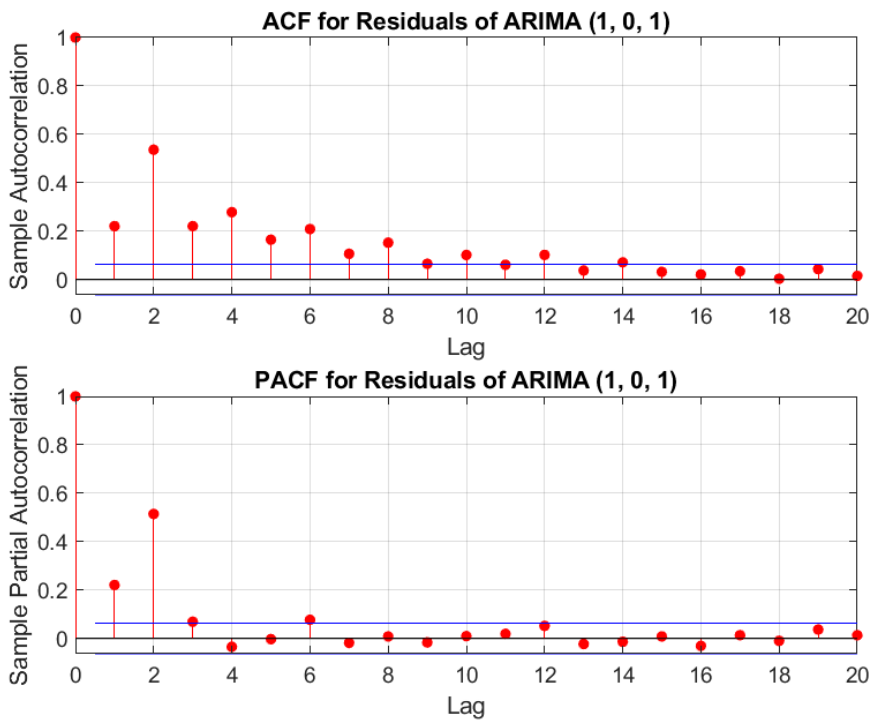

Figure 8: ACF/PACF of Residuals of ARIMA(1,0,1)

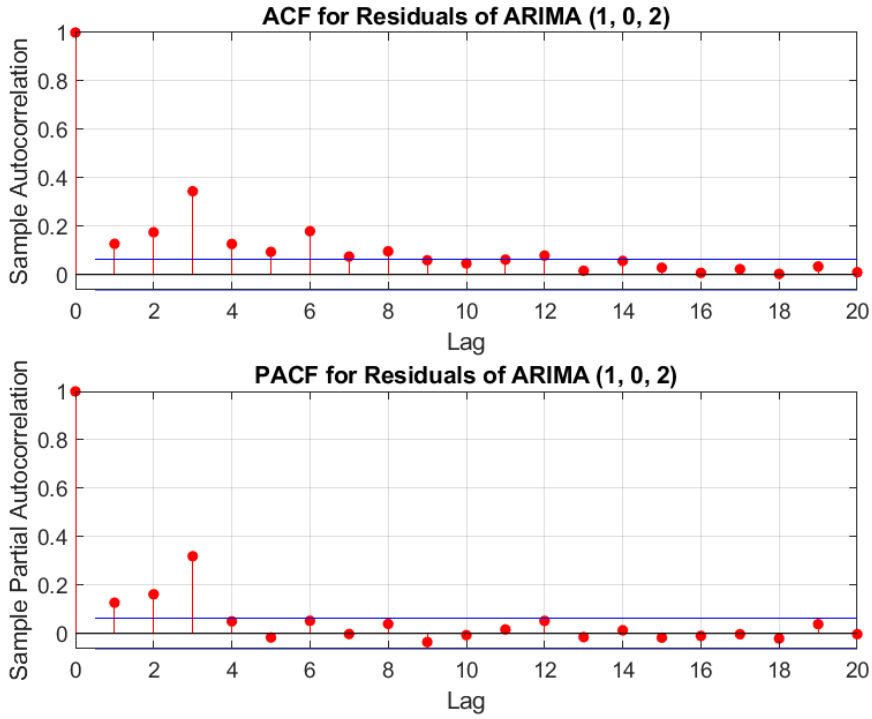

Figure 9: ACF/PACF of Residuals of ARIMA(1,0,2)

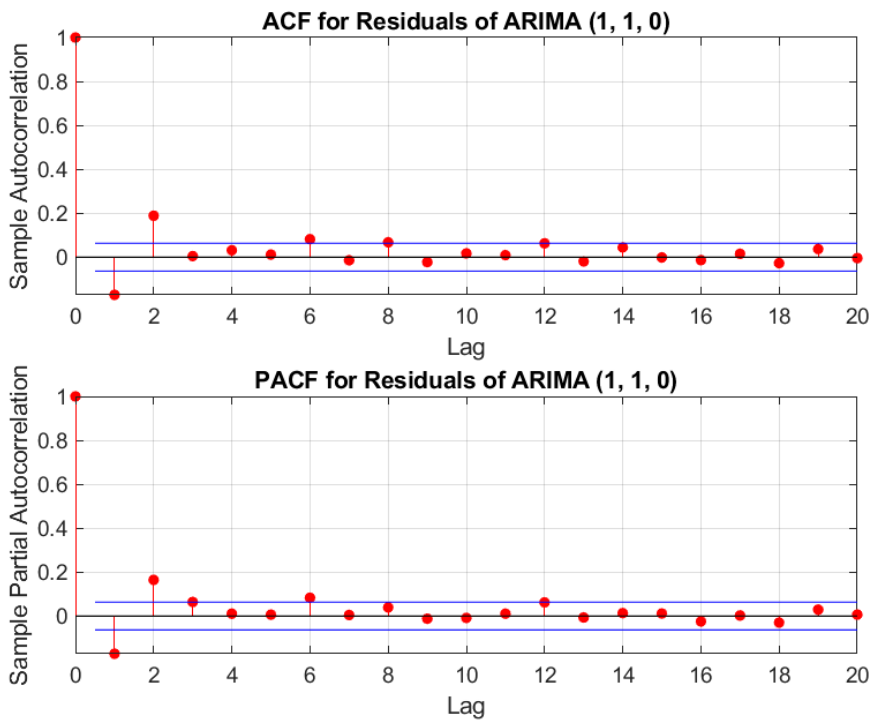

Figure 10: ACF/PACF of Residuals of ARIMA(1,1,0)

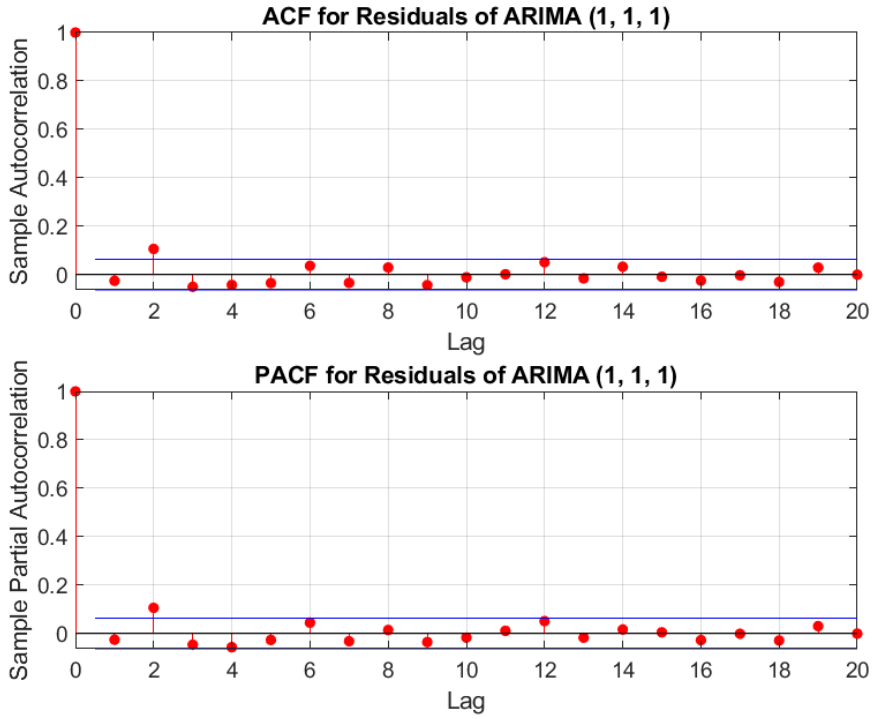

Figure 11: ACF/PACF of Residuals of ARIMA(1,1,1)

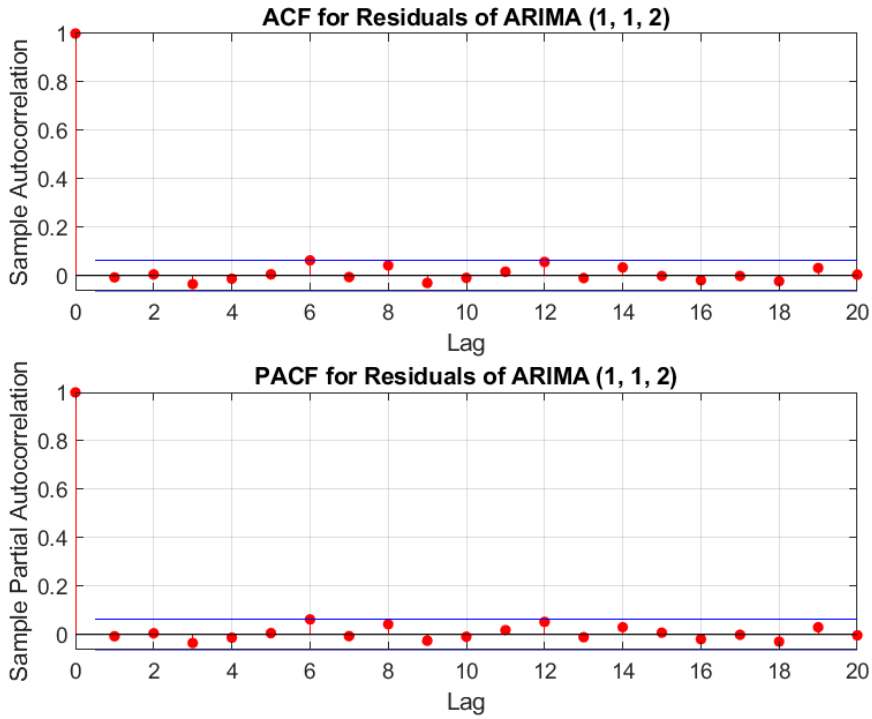

Figure 12: ACF/PACF of Residuals of ARIMA(1,1,2)

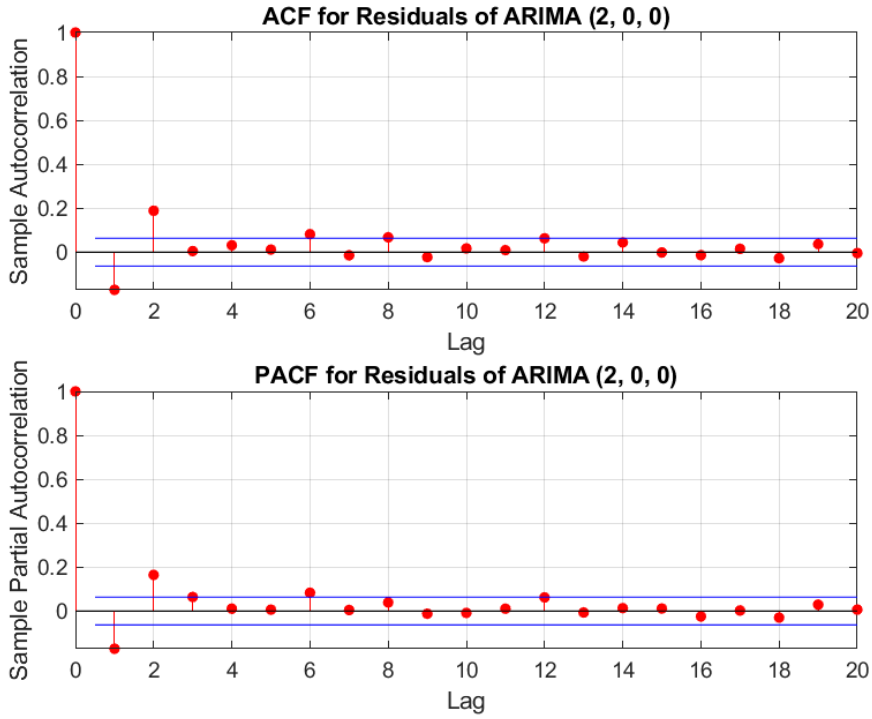

Figure 13: ACF/PACF of Residuals of ARIMA(2,0,0)

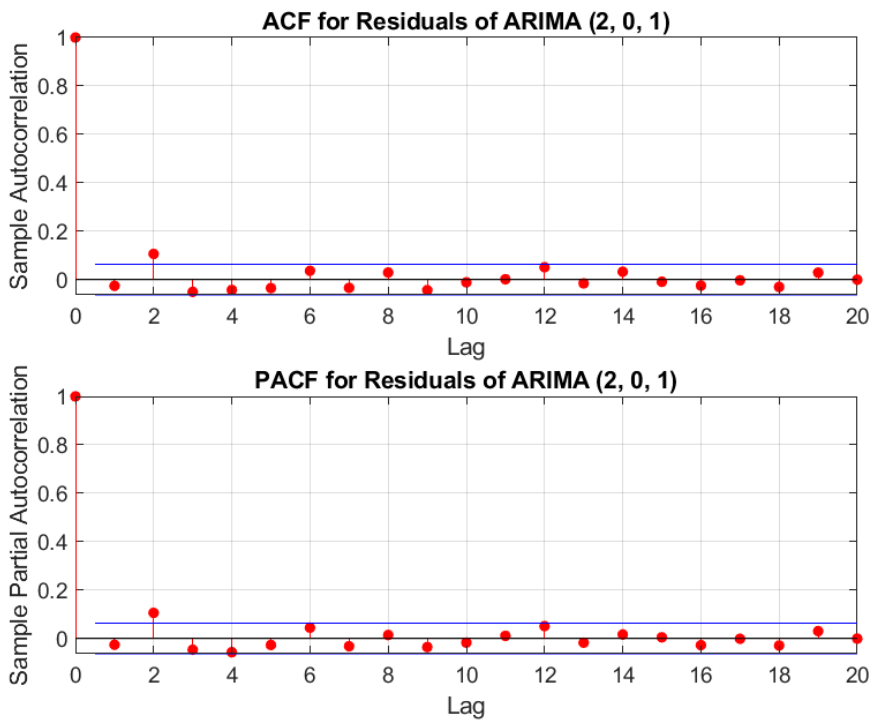

Figure 14: ACF/PACF of Residuals of ARIMA(2,0,1)

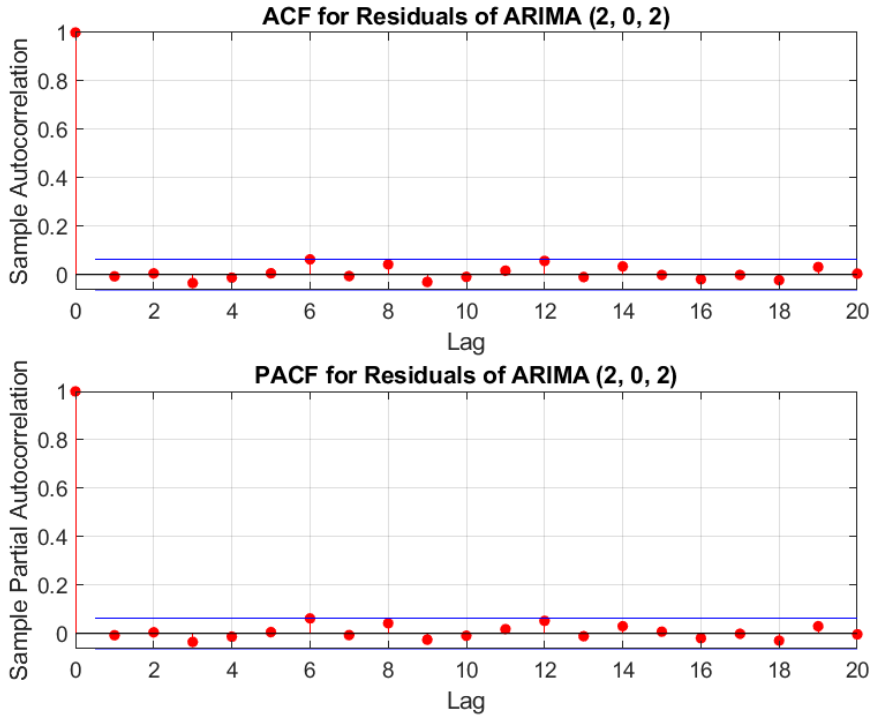

Figure 15: ACF/PACF of Residuals of ARIMA(2,0,2)

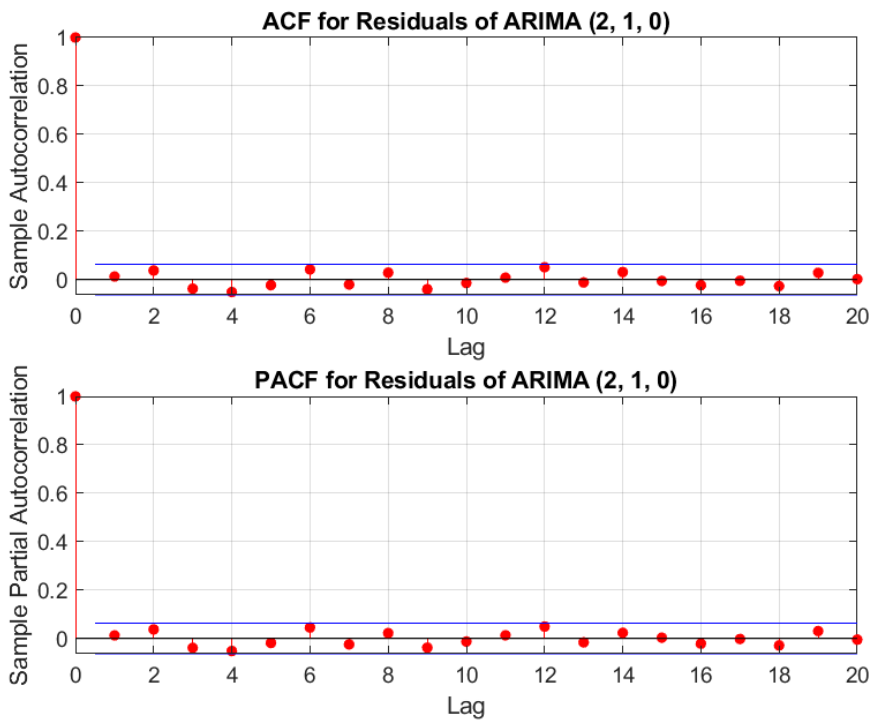

Figure 16: ACF/PACF of Residuals of ARIMA(2,1,0)

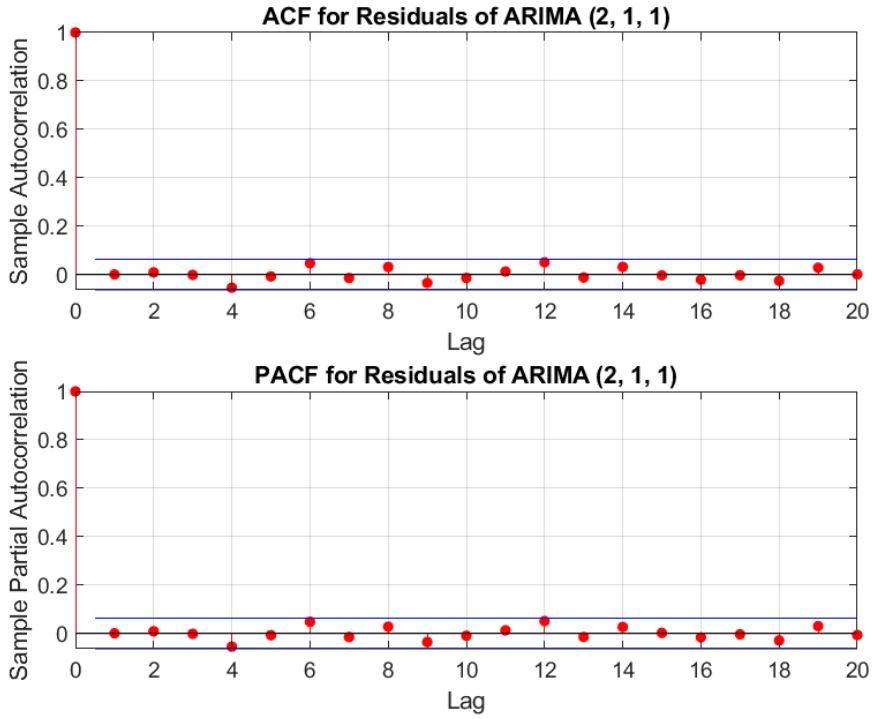

Figure 17: ACF/PACF of Residuals of ARIMA(2,1,1)

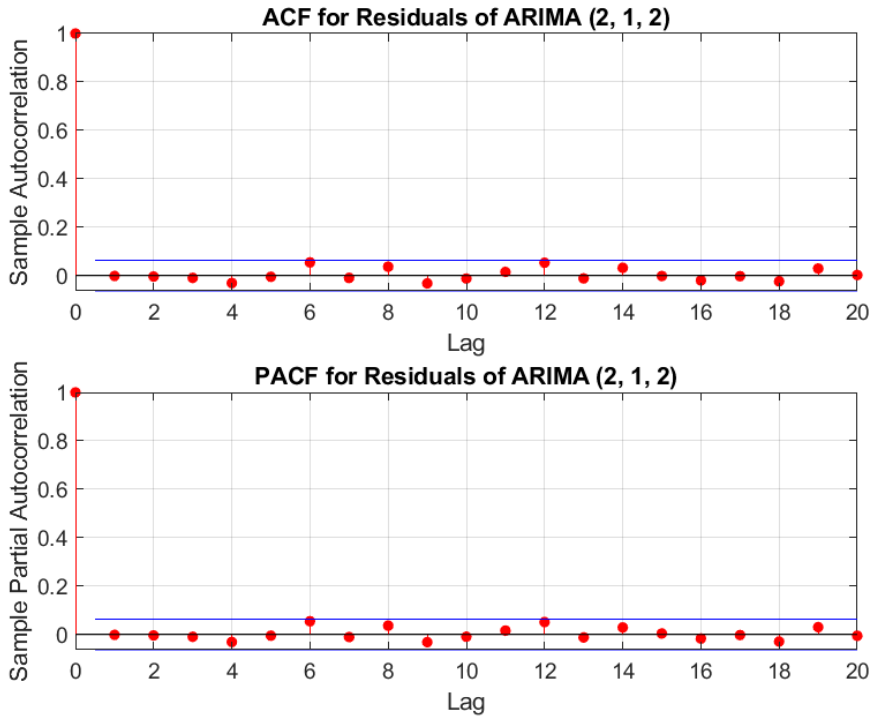

Figure 18: ACF/PACF of Residuals of ARIMA(2,1,2)

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Y_t ADF Statistic: 2.155232
Y_t Critical Value: -1.941599
Y_t is non-stationary

First-differenced Y_t ADF Statistic: -13.494930
First-differenced Y_t Critical Value: -1.941598
First-differenced Y_t is stationary

Second-differenced Y_t ADF Statistic: -46.095536
Second-differenced Y_t Critical Value: -1.941597
Second-differenced Y_t is stationary
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Figure 19: ADF Tests

	A	B	C	D	E	F	G
1	ARIMA(p,d,q)			Estimated Coefficients			
2	p	d	q	AR(1)	AR(2)	MA(1)	MA(2)
3	1	0	0	1	--	--	--
4	1	0	1	1	--	0.461	--
5	1	0	2	1	--	0.494	0.423
6	1	1	0	0.694	--	--	--
7	1	1	1	0.835	--	-0.278	--
8	1	1	2	0.759	--	-0.215	0.152
9	2	0	0	1.694	-0.694	--	--
10	2	0	1	1.835	-0.835	-0.278	--
11	2	0	2	1.759	-0.759	-0.215	0.152
12	2	1	0	0.523	0.246	--	--
13	2	1	1	0.337	0.376	0.196	--
14	2	1	2	0.497	0.226	0.04	0.078

Figure 20: Model Estimation